

REMARKS

The claims have been amended to clarify the invention and better distinguish the invention from the prior art.

The art rejections are respectfully traversed. Considering first the rejection of claims 1, 11, 12, 54, 55, 60, 61, 66, 76, 77, 89, 93, 110-114 and 117 as obvious from Fray et al. alone or alternatively in view of Westfall, the primary reference, Fray et al. is quite different from Applicants' claimed invention. Fray et al. essentially involves electrochemical deoxidation (EDO) of a metallic oxide, i.e., reduction of, e.g., titanium oxide. In the Fray et al. process, the titanium oxide is the cathode (-), i.e. the electrode where reduction occurs (i.e., gain of electrons), and the oxygen from the solid oxide is reduced at the cathode and diffuses/migrates towards the carbine anode (+) where it is oxidized and evolves as CO/CO₂. In Fray et al., the molten salt electrolyte must exhibit a strong ability to transport oxygen anion (e.g., CaCl₂). This is totally different from Applicants' claimed process where the composite material is used as an anode (+), which upon anodic oxidation/dissolution releases higher valence titanium cations into the electrolyte that diffuse/migrate toward the cathode where they are cathodically reduced to metal as required by Applicants' independent claims 1, 60, 66, 110 and 112. Thus, independent claims 1, 60, 66, 110 and 112 and the several claims which depend thereon cannot be said to be obvious from Fray et al.

The secondary reference Westfall does not supply the missing teachings to Fray et al. to achieve or render obvious any of Applicants' claims. Westfall actually is quite remote. Westfall discloses a method to produce tin or other elemental crystals by electrolysis. The Examiner cites Westfall as teaching adding concentrated HCl to molten salt electrolytes in

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order to allow for lower melting temperature of the electrolyte. However, it is submitted that the Examiner has taken this teaching of Westfall out of context. The addition of concentrated HCl is taught by Westfall only in connection with an aqueous electrolyte. (See column 9, lines 33-35). There is no teaching or suggestion in Westfall of the addition of HCl to molten salt electrolytes. Moreover, the addition of HCl to a molten salt electrolyte would be counterindicated since hydrogen chloride is known to attack titanium metal. In fact, this is a known method to prepare titanium dichloride and titanium trichloride in molten salt electrolytes. Accordingly, it is submitted that Westfall does not supply the missing teachings to Fray et al. to achieve or render obvious independent claims 1, 60, 66, 110 and 112 or the several claims dependent thereon, as the case may be.

Independent claim 54, and claim 55, which depends thereon, are similarly allowable over the Fray et al. alone or in combination with Westfall for the same reasons above adduced relative to independent claims 1, 60, 66, 110 and 112, as well as for their own additional limitations.

Turning to the rejection of claims 58, 59, 64 and 65 as obvious from Fray et al. alone or in combination with Westfall and further in view of Steinberg, claims 58 and 59 are dependent on claim 54, and claims 64 and 65 are dependent on claim 60. The deficiencies of Fray et al alone or in combination of with Westfall vis-à-vis claims 54 and 60 are discussed above. It is not seen that Steinberg supplies the missing teachings to claims 54 and 60 to achieve or render obvious those claims or any claims dependent thereon. Steinberg has been cited as teaching specific proportions of titanium, carbon and oxygen as being effective in achieving a titanium metal product free from unreduced oxides and carbides. Even assuming *arguendo*, Steinberg is

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as the Examiner states, neither Fray et al alone or a combination of Fray et al, alone or Westfall and Steinberg would achieve or render obvious any of claims 58, 59, 64 and 65.

Turning to the rejection of claim 85 as obvious from Fray et al. in view of Westfall and further in view of ASM, claim 85 is dependent on claim 60. The deficiencies of Frey et al alone or in combination with Westfall vis-à-vis claim 60 are discussed above. The Examiner cites ASM as teaching that titanium would be sintered in a vacuum or inert gas atmosphere in order to prevent the formation of additional oxides. However, in claim 86, the sintering is performed under inert atmosphere for the preparation of the composite anode in order to consolidate the titanium oxycarbide and it is different from the sintering of pure titanium metal powder. Therefore, even assuming arguendo ASM is as the Examiner suggests, Fray et al alone or in combination with Westfall and ASM still would not achieve or render obvious claim 60 or claim 85 which depends thereon.

Turning to the rejection of claims 89-95 and 114-119 as obvious from Fray et al. alone or in view of Westfall and further in view of Slatin, claims 89-95 are directly or indirectly dependent on claim 66, and claims 114 – 119 are directly or indirectly dependent on claim 112. The deficiencies of Fray et al. alone or in combination with Westfall vis-à-vis claims 66 and 112, respectively, are discussed above. It is not seen that Slatin supplies the missing teachings to Fray et al. and Westfall to achieve or render obvious claims 66 and 112 or any of the claims which depend thereon. Slatin discloses a method to reduce titanium tetrachloride with titanium metal into a molten salt electrolyte to provide titanium (II) and (III) cations in the melt.

However, the more basic and essential teaching missing from Fray et al. alone or in combination with Westfall is not supplied by Slatin. Thus, neither Frey et al, or any

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combination of Fray et al., Westfall and Slatin reasonably could be said to achieve or render obvious claim 66 or claim 112 or claims 89-95 and 114-119 which depend thereon.

Turning next to the rejection of claims 1, 11, 12, 54, 55, 60, 61, 110 and 111, as obvious from Ward Close et al. alone or in combination with Westfall, Ward Close et al. is as similar to Fray et al. in teaching electrochemical deoxidation to produce titanium metal from the reduction of a cathode preform, which is the case of Ward Close et al is a sintered mass of titanium oxide. This is completely different from Applicant's claimed invention in which the composite material is used as an anode, which upon anodic oxidation, causes dissolution which releases higher valence titanium cations into the electrolyte that diffuse/migrate towards the cathode where they are cathodically reduced to metal as previously discussed. Thus, claims 1, 54, 60 and 110 and the several claims dependent thereon cannot be said to be obvious from Ward Close et al. alone or in combination with Westfall as above discussed. Thus, no combination of Ward Case et al and Westfall could be said to achieve or render obvious claims 1, 54, 60 and 110 or any claim dependent thereon.

Turning to the rejection of claims 58, 59, 64 and 65 as obvious from Ward Close et al. alone or in view of Westfall and further in view of Steinberg, these claims are dependent on claims 54 or 60, as the case may be. As noted supra, Ward Close et al. has the same deficiencies as Frey et al vis a vis claims 54 and 60. Thus, the arguments above adduced regarding the rejection of claims 54 and 60 based on Fray et al. alone or with Westfall and Steinberg equally apply to the rejection based on Ward Close et al. along or in view of Westfall and Steinberg. Thus, claims 58, 59, 64 and 65 which depend on claims 54 or 60, as the case may be are allowable over Ward Close et al. alone or in combination with Westfall and

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Steinberg for the same reasons above adduced relative to claims 54 and 60 as well as for their own additional limitations.

Turning finally to the rejection of claim 85 as obvious from Ward Close et al. alone or in view of Westfall and further in view of ASM, claim 85 depends on claim 60. As noted supra, Ward Close et al. is similar to Fray Et al. Thus, the same comments as set forth above regarding the rejection of claim 60 as obvious from Fray et al. alone or in view of Westfall and ASM apply equally to the rejection of claim 85 as obvious from Ward Close et al. alone or with Westfall and ASM.

Having dealt with all the rejections raised by the Examiner, it is believed that the Application now is in order for allowance.

In the event there are any fee deficiencies or additional fees are payable, please charge them (or credit any overpayment) to our Deposit Account Number 08-1391.

Respectfully submitted,



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